



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,531	04/25/2001	Hyon T. Kim	5181-83600	7257
58467	7590	02/20/2008		
MHKKG/SUN P.O. BOX 398 AUSTIN, TX 78767			EXAMINER MEUCCI, MICHAEL D	
			ART UNIT	PAPER NUMBER
			2142	
			MAIL DATE	DELIVERY MODE
			02/20/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/842,531

Applicant(s)

KIM, HYON T.

Examiner

MICHAEL D. MEUCCI

Art Unit

2142

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-34, 36, 37, 39-42, 44, 45, 47-49, 51, 52, 54-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-34, 36, 37, 39-42, 44, 45, 47-49, 51, 52, 54-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. This application has been reassigned to Michael Meucci.
2. This action is in response to the Request for Continued Examination (RCE) filed 12 July 2007.
3. Examiner acknowledges the cancellation of claims 5, 8, 13, 16, 20, 23, 35, 38, 43, 46, 50, 53, 65, 68, 73, 76, 80 and 83.
4. Claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-34, 36, 37, 39-42, 44, 45, 47-49, 51, 52, 54-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 are currently pending.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 62-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 62-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 recite the limitation "computer readable medium" in line 1 of each claim, while claim 61 recites a "computer readable storage medium." There is insufficient antecedent basis for the limitation "computer readable medium" in the claim. Examiner suggests replacing all instances of "computer readable medium" with "computer readable storage medium." Correction is required.

Art Unit: 2142

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 61-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-90 are rejected under 35 U.S.C. 101 because they include non-statutory subject matter. The claimed "computer readable storage medium" is not explicitly defined by the applicant's specification, however, "computer readable medium" is defined in the specification as: "a computer readable medium may include storage media or memory media such as magnetic or optical media, e.g., disk or CD-ROM, volatile or non-volatile media such as RAM (e.g. SDRAM, DDR SDRAM, RDRAM, SRAM, etc.), ROM, etc. as well as transmission media or signals such as electrical, electromagnetic, or digital signals, conveyed via a communication medium such as network and/or a wireless link," (see paragraph [0090] on page 31 of applicant's specification). Specifically, the "transmission media or signals such as electrical, electromagnetic, or digital signals, conveyed via a communication medium such as network and/or a wireless link" are not considered statutory subject matter. Correction is required.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 2142

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-29, 31-34, 36, 37, 39-42, 44, 45, 47-49, 51, 52, 54-59, 61-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shah et al. (U.S. 7,039,922 B1) hereinafter referred to as Shah, in view of Jibbe (U.S. 6,367,033 B1).

a. As to claim 1, Shah discloses a method for handling fabric state changes, comprising: a host system (Figs. 7, 8, 10, host 210 or 212 with administrator 720 with central fabric manager 710) receiving from a fabric (Figs. 7, 8, 10, fabric 202) coupled to the host system an event indicating a fabric state change (Figs. 7, 8, 10; fabric services 712 of the fabric manager 710 detecting I/O units for faults or link failures or device removal, col. 8, lines 48-50) for one or more host adapter ports (Fig. 2, I/O units 1 and 2) Of said host system (the central fabric manager 710 may be configured for learning physical cluster topology, detecting and managing faults or link failures in the data network 200 (see FIG. 2) and performing other network management functions, such as, for example, assignment of fabric-attached I/O controllers to cluster hosts 210 and 212, programming of forwarding tables at cluster switches such that the redundancy built into the topology is mapped as multiple paths between cluster hosts 210 and 212 and fabric- attached agents (e.g., I/O controllers), and reporting of multiple paths between the cluster hosts 210 and 212 and the fabric-attached agents (e.g., I/O controllers), col. 8, lines 24-63; col. 9, line 64 - col. 10, line 12; col. 12, lines 27-50); and the host system dynamically changing the host system's fabric device configuration in response to said receiving an event (At step 5 shown in FIG. 7, the I/O controller

Art Unit: 2142

manager 7140 may send a message to the host-fabric adapter 325 of the host to which the new I/O controller has been assigned. This message to the host informs the host of the presence of the new I/O Controller, and provides (explicitly or implicitly) authorization for the host to access the new I/O controller. In the event that an I/O controller has been removed from the cluster fabric 202 or has been reassigned to another host in the cluster fabric 202, a similar message may be sent to the host (the previous owner) indicating that the I/O controller is not available or is no longer assigned to the host. This allows the administrator and/or the I/O controller manager 714 to dynamically add, remove, or reassign I/O controllers in the cluster fabric 202 and quickly inform the affected hosts of this change in the assignment or ownership of the fabric-attached I/O controllers, col. 9, line 30- col. 10, line 62); wherein said host system dynamically changing comprises the host system bringing online (adding (inserting), initializing, assigning, and connecting (attaching)) or taking offline (removing or reassigning or detaching) one or more devices for the one or more host adapter ports for the host system (Figs. 7, 8, 10; col. 8, lines 24-63; col. 9, line 30- col. 10, line 62; col. 12, lines 27-50); wherein said bringing online comprises creating an operating system node for each of the one or more fabric devices being brought online, wherein each operating system node provides a communication mechanism to a corresponding fabric device (Figs. 7, 8, 10; the fabric bus driver 620 on the host 210 creates a separate device object for each port of the host-fabric adapter 325 that can be used to communicate with the target fabric-attached I/O controller, col. 8, line 24 - col. 10, line 62; col. 11, line 40 - col. 12, line 50; col. 13, lines 23-57); wherein said taking offline comprises disabling an

Art Unit: 2142

operating system node for each of the one or more fabric devices being taken offline, wherein each operating system node provides a communication mechanism to a corresponding fabric device (Figs. 7, 8, 10; a message sent to the host (the previous owner) indicating that the I/O controller is not available or is no longer assigned to the host, col. 8, lines 24-63; col. 9, line 30- col. 10, line 62; col. ~2, lines 27-50; col. 13, lines 23-57).

Shah does not explicitly teach: wherein each given operating system node provides a communication interface to a given corresponding fabric-attached mass storage device, and wherein an application running on said host system is configured to communicate with said given corresponding fabric-attached mass storage device through said given operating system node. However, Jibbe discloses: "Host-side monitor and analyzer 125 is coupled to a mass storage database 130. In a Fibre Channel arbitrated loop topology, host-side hub 110 may involve a node capable of routing traffic to host-side monitor and analyzer 125. In other embodiments, host-side monitor and analyzer 125 may be connected as a node into the arbitrated loop itself in which case function of the host-side hub 110 is built into host-side monitor and analyzer 125. In Fibre Channel systems involving a switching fabric oriented topology, host-side hub 110 may involve a switching fabric used to route traffic between nodes and send a copy of selected traffic to host-side monitor and analyzer 125," (lines 6-17 of column 5). It would have been obvious for one of ordinary skill in the art at the time of the applicant's invention to have each given operating system node provide a communication interface to a given corresponding fabric-attached mass storage device,

Art Unit: 2142

and wherein an application running on said host system is configured to communicate with said given corresponding fabric-attached mass storage device through said given operating system node. "In some systems, the functionality of host-side monitor and analyzer 125 may be built into one of host computer 105's host adapters and the mass storage database 130 may be implemented on a hard disk connected into the system 100," (lines 17-21 of column 5 in Jibbe). It is for this reason that one of ordinary skill in the art at the time of the applicant's invention would have been motivated to have each given operating system node provide a communication interface to a given corresponding fabric-attached mass storage device, and wherein an application running on said host system is configured to communicate with said given corresponding fabric-attached mass storage device through said given operating system node in the system as taught by Shah.

b. As to Claim 2, Shah discloses, determining an event type for said event (removal of the existing path due to an error or due to manual reconfiguration of the cluster fabric, col. 12, lines 43-45, col 13, line 54).

c. As to claim 3, Shah discloses, wherein if the event type indicates that one of the fabric host adapter ports has lost connectivity to the fabric, said dynamically changing comprises taking offline one or more fabric devices configured through the host adapter port that lost connectivity to the fabric (Figs. 7, 8, 10; col. 8, lines 24-63; col. 9, line 30 - col. 10, line 62; col. 12, lines 27-50; col 13, lines 23-57).

d. As to claim 4, Shah discloses, wherein said taking offline one or more fabric devices configured through the host adapter port that lost connectivity to the

Art Unit: 2142

fabric comprises: reading a persistent repository (looking up a database) that indicates which fabric devices are currently online for the host adapter port that lost connectivity to the fabric; and taking offline (removing) the fabric devices indicated by the persistent repository for the host adapter port that lost connectivity to the fabric (Figs. 7, 8, 10; col. 8, lines 24-63; col. 9, line 30 - col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

e. As to claim 6, Shah discloses, wherein if the event type indicates that one of the fabric host adapter ports has lost connectivity to the fabric, said dynamically changing comprises: accessing a configuration file (looking up a database, col. 9, lines 54-63) for the host adapter port that lost connectivity to the fabric to determine if fabric devices for that host adapter port are to be unconfigured (unassigned) if that host adapter port loses connectivity to the fabric; and if the configuration file indicates that fabric devices are to be unconfigured upon lose of connectivity to the fabric, taking offline one or more fabric devices configured through the host adapter port that lost connectivity to the fabric (Figs. 7, 8, 10; a message sent to the host (the previous owner) indicating that the I/O controller is not available or is no longer assigned to the host, col. 8, lines 24-63; col. 9, line 30- col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

f. Claim 7 introduces identical limitations of claim 4; therefore, it is rejected under the same rationale as in claim 4.

g. As to claim 9, Shah discloses, prior to said receiving an event: a host adapter driver for one of the one or more host adapter ports becoming inactive or detached; and generating the event (the message) indicating that one of the one or

Art Unit: 2142

more host adapter ports has lost connectivity to the fabric (Figs. 7, 8, 10; step 5 in Figure 7; col. 8, lines 24- 63; col. 9, line 30- col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

h. As to claim 10, Shah discloses, wherein said accessing a configuration file for the host adapter port that lost connectivity to the fabric comprises reading a user-defined attribute (a MAC or network address) in the configuration file, wherein the user-defined attribute indicates whether or not fabric devices for that host adapter port are to be unconfigured (unassigned) if that host adapter port loses connectivity to the fabric (Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

i. As to claim 11, Shah discloses, wherein if the event type indicates that one of the fabric host adapter ports has acquired connectivity to the fabric, said dynamically changing comprises bringing online one or more fabric devices for the host adapter port that has acquired connectivity to the fabric (Figs. 7, 8, 10; step 2 in Figure 7, the fabric service 712 detects the new I/O controller attached to the cluster fabric 202 and assign a MAC or network address to the new I/O unit and initialize the I/O by setting the ports of the I/O unit 1 to an active state, col. 9, lines 35-42).

j. As to claim 12, Shah discloses, wherein said bringing online one or more fabric devices for the host adapter port that has acquired connectivity to the fabric comprises: reading a persistent repository (looking up the database) that indicates which fabric devices were previously online for the host adapter port .that has acquired connectivity to the fabric; and bringing online the fabric devices indicated by the persistent repository for the host adapter port that has acquired connectivity to the fabric

Art Unit: 2142

(Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 11, line 40 - col. 12, line 50; col. 13, lines 23-57).

k. As to claim 14, Shah discloses, wherein if the event type indicates that one of the fabric host adapter ports has acquired connectivity to the fabric, said dynamically changing comprises: accessing a configuration file (a database) for the host adapter port that has acquired connectivity to the fabric to determine if fabric devices for that host adapter port are to be configured (assigned) if that host adapter port acquires connectivity to the fabric; and if the configuration file indicates that fabric devices are to be Configured (assigned) upon that host adapter port's connectivity to the fabric, bringing online one or more fabric devices for that host adapter port that has acquired connectivity to the fabric (Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 11, line 40 - col. 12, line 50; col 13, lines 23-57).

l. Claim 15 introduces identical limitations of claim 12; therefore, it is rejected under the same rationale as in claim 12.

m. As to claim 17, Shah discloses, prior to said receiving an event: a host adapter driver for one of the one or more host adapter ports becoming active or attached; and generating the event (the message) indicating that one of the one or more host adapter ports has acquired connectivity to the fabric (Figs. 7, 8, 10; step 5 in Figure 7; col. 8, line 24 -col. 10, line 62; col. 11, line 40 - col. 12, line 50; col 13, lines 23-57).

n. As to claim 18, Shah discloses, wherein said accessing a configuration file for the host adapter port that has acquired connectivity to the fabric comprises reading a user- defined attribute in the configuration file, wherein the user-define attribute

Art Unit: 2142

indicates whether or not fabric devices for that host adapter port are to be configured if that host adapter port acquires connectivity to the fabric (Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

o. As to claim 19, Shah discloses, wherein if the event type indicates that a new fabric device has been connected to the fabric, said dynamically changing comprises bringing online the new fabric device for one of the one or more host adapter ports (Figs. 7, 8, 10; col 8, line 24 - col. 10, line 62; col 12, lines 27-50; col. 13, lines 23-57).

p. As to claim 21, Shah discloses, wherein said bringing online the new fabric device comprises updating a persistent repository to indicate that the new fabric device is online for the host adapter port.(Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

q. As to claim 22, Shah discloses, wherein if the event type indicates that a new fabric device has been connected to the fabric, said dynamically changing comprises: accessing a configuration file for one of the one or more host adapter ports to determine if newly connected fabric devices for that host adapter port are to be dynamically configured; and if the configuration file indicates newly connected fabric devices are to be dynamically configured, bringing online the new fabric device for that host adapter port (Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 12, lines 27-50; col 13, lines 23- 57).

r. Claim 24 introduces identical limitations of claim 21 ; therefore, it is rejected under the same rationale as in claim 21.

Art Unit: 2142

s. As to claim 25, Shah discloses, prior to said receiving an event: connecting the fabric device to the fabric; and a fabric driver generating the event (the message) indicating that the new fabric device has been connected to the fabric (col. 9, line 30 - col. 10, line 62).

t. As to claim 26, Shah discloses, wherein said accessing a configuration file comprises reading (looking up) a user-defined attribute in the configuration file, wherein the user define attribute indicates whether or not newly connected fabric devices for that host adapter port are to be dynamically configured upon detection (Figs. 7, 8, 10; col. 8, line 24 - col. 10, line 62; col. 12, lines 27-50; col. 13, lines 23-57).

u. As to claim 27, Shah discloses, wherein the one or more host adapter ports comprise Fibre Channel host adapter ports (col 14, lines 55-60).

v. As to claim 28, Shah discloses, wherein the fabric comprises a Fibre Channel switched fabric comprising a plurality of Fibre Channel switches (col. 14, lines 55-60).

w. As to claim 29, Shah discloses, wherein the fabric is part of a storage area network (SAN), and wherein the fabric devices comprise storage devices (col. 14, lines 55-60).

x. Claims 31-34, 36, 37, 39-42, 44, 45, 47-49, 51, 52, 54-59 are system claims corresponding to the method of claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-29; therefore, they are rejected under the same rationale as claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-29.

Art Unit: 2142

y. Claims 61-64, 66, 67, 69-72, 74, 75, 77-79, 81, 82, and 84-89 are apparatus claims (computer readable storage medium) corresponding to the method of claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-29; therefore, they are rejected under the same rationale as claims 1-4, 6, 7, 9-12, 14, 15, 17-19, 21, 22, 24-29.

10. Claims 30, 60, and 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shah and Jibbe as applied to claims 1, 31, and 61 respectively, in view of Lee et al. (U.S. 6,889,380 B1) hereinafter referred to as Shah '380.

As to claims 30, 60, and 90, Shah does not explicitly disclose, verifying the one or more, fabric devices before bringing the one or more fabric devices online, wherein said verifying comprises accessing a fabric name server to determine if the one or more fabric devices are currently connected to the fabric. However, in the same field of endeavor, Shah '380 discloses the fabric control driver simply verifies that the local channel adapter is ready for connectivity and then loads the driver (Shah '380, col 9, lines 41-62; col. 10, lines 40-59, col. 11, lines 32-51) for the purpose of successfully loading host-side drivers in the data networks (Shah '380, col. 1, lines 38- 40).

Response to Arguments

11. Applicant's arguments, see arguments, filed 12 July 2007, with respect to the rejection(s) of claim(s) 1, 31, and 61 under 35 U.S.C. 102(e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon

Art Unit: 2142

further consideration, a new ground(s) of rejection is made in view of Jibbe as provided above.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Meucci at (571) 272-3892. The examiner can normally be reached on Monday-Friday from 9:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Caldwell, can be reached at (571) 272-3868. The fax phone number for this Group is 571-273-8300.

Communications via Internet e-mail regarding this application, other than those under 35 U.S.C. 132 or which otherwise require a signature, may be used by the applicant and should be addressed to [michael.meucci@uspto.gov].

All Internet e-mail communications will be made of record in the application file. PTO employees do not engage in Internet communications where there exists a possibility that sensitive information could be identified or exchanged unless the record includes a properly signed express waiver of the confidentiality requirements of 35 U.S.C. 122. This is more clearly set forth in the Interim Internet Usage Policy published in the Official Gazette of the Patent and Trademark on February 25, 1997 at 1195 OG 89.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

Art Unit: 2142

applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Andrew Caldwell", with a stylized flourish at the end.

ANDREW CALDWELL
SUPERVISORY PATENT EXAMINER